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Uncommon collaboration: Mars' partnership with the Lindau Nobel Laureate Meetings

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Why does Mars partner with the Lindau meetings?
We have partnered with the Lindau Nobel Laureate Meetings for the past ten years to support the meetings' mission to 'Educate. Inspire. Connect.'

Scientists have a crucial part to play in addressing the grand challenges that global society faces, many of which are inherently linked to food. Lindau is an unrivalled platform to bring together the world's leading scientists to explore solutions to these challenges — solutions that would have a beneficial impact on society and also positively impact the sustainability of Mars' business.

What does it mean to be a partner of the Lindau meetings?
In addition to providing support for young researchers to attend the meetings every year, we host events and discussions for the Nobel laureates and young scientists to grapple with important topics in food, agriculture and health, as well as related areas such as energy and climate change. Last year, for example, we convened a session to explore scientific research that could help provide safe and nutritious food for a world population that is estimated to reach 9 billion by 2050.

What was Mars' involvement in Lindau this year?
This year, we further explored the topic of food security, gathering a group of Lindau researchers to discuss the potential of computational science in this context. Mars' partner IBM provided insights on artificial intelligence and the use of big data for metagenomics and food safety. We were also joined by Ben Santer from the Lawrence Livermore National Laboratory, who presented an overview of his research into climate models and the causes of climate change.

We also hosted an interactive breakfast discussion for the young scientists, which asked the question 'Why does soft matter matter?' One of the young scientists at the event, Adriana Marais from the University of KwaZulu-Natal in Durban, South Africa, joined the panel at the event and inspired us all while discussing areas of research that seek to understand one of the most complex soft-matter materials of all — life.

What do you want the young scientists to take away from these events?
These events are an opportunity to highlight what is possible through collaboration across sectors and disciplines. But, more than that, we want to connect researchers from different scientific disciplines and generations and inspire them to continue conversations about these complex challenges in food, agriculture and health when they return home. We want them to work together and define new, fruitful avenues of research.

What are Mars' research interests in this area?
The collaboration we encourage in the young scientists at Lindau is a reflection of how we approach our own fundamental and applied scientific research portfolio. We conduct scientific research to better understand the areas of food, agriculture and health in order to contribute to the financial, environmental and social sustainability of our business and the wider food and agricultural industry. To succeed in these activities means we need to collaborate in uncommon ways. Food systems are so complex and inter-related that we need to work with the best scientists and institutions around the world from various sectors and disciplines to have a meaningful impact. ■

Much of Mars' research is based on collaboration. Mars, for example, has been conducting research to better understand the nutritional and biomedical properties of cocoa flavanols with a network that includes Columbia University, the University of California, Davis, and the Heinrich Heine University Düsseldorf.

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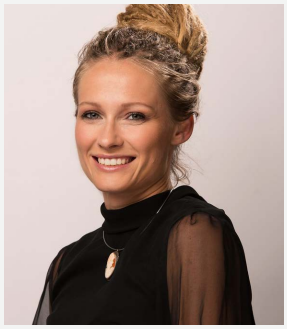
Young scientist perspective: the Mars Science Breakfast



At the 2016 Lindau Nobel Laureate Meeting, Mars hosted a Science Breakfast for 100 of the scientists attending the conference to ask, 'Why does soft matter matter?' Adriana Marais joined the panel discussion to offer her views on soft matter, scientific exploration and the origins of life. She is a postdoctoral researcher in quantum biology at the University of KwaZulu-Natal, in Durban, South Africa and one of the 100 finalists in Mars One's Project Astronaut who could be flying to Mars in 2026.

Why did you attend this year's Lindau meetings?
I was nominated to attend the Lindau Nobel Laureate meeting by Quarraisha Abdool Karim at the University of KwaZulu-Natal.

What was the Mars Science Breakfast about and why were you interested?
The panel discussion was on the question, 'Why does soft matter matter?' As a final round astronaut candidate with Mars One's project to move to the red planet in 2026, I wanted to show that there was more to my participation in the Mars panel discussion than a play on words! It was daunting to give my opinions alongside such accomplished scientists, but in the end we had an animated discussion on topics including genetic modification, artificial intelligence and extraterrestrial life.

As a researcher in quantum biology, I addressed the category of the soft matter that constitutes living organisms. I think that the most profound contributions of science to humanity are towards answering the big questions, like 'What is life?' The emergence of life from the inanimate matter of which it is constituted is one of the biggest open problems in science today. I think that we understand more about the origins of the universe than we do about the origins of life.

Research in the field of quantum biology is already contributing to the development of highly efficient biologically-inspired artificial photosynthetic systems that are essential for both renewable energy and food security, as well as raising fascinating questions about the origins and nature of life itself.

What motivated you to apply to be an astronaut on the Mars One project?
We have the possibility to call another planet home for the first time and untold discoveries lie in wait. We may even find evidence of life there, which would be a giant leap in terms of understanding who we are, where we come from and where we are going. I have applied and been shortlisted, along with 99 others from around the planet, to go and live on Mars because I would be prepared to sacrifice a lot for this idea — even returning to Earth.

I think that many of the global challenges we are facing on Earth are the result of poor resource utilisation. For millennia, we have lived here under the illusion that resources are infinite. Now, we are being forced to acknowledge that they are not, and that we need to implement changes in our interaction with the environment to sustain our society and our species. Life on Mars will be a precious resource, and I believe deep appreciation for life and all that is needed to sustain it will characterise morality there, and, I hope, filter down to Earth.

What did you take away from the meetings?
It was an honour to be able to participate in the exchange of knowledge, ideas and experience between Nobel Laureates and young scientists, as well as to be able to share what I have learnt with scientists back in South Africa.

For me the overwhelming take-home message from discussions with the Laureates and young scientists both in and in between sessions is that we are living in a unique era, in which we are experiencing unprecedented innovation and development in science and technology, as well as global challenges of unprecedented scale and gravity. In education, in fundamental and applied scientific research, and in industry, we need to acknowledge the role of the interdisciplinary collaboration that will be essential to tackling and solving the challenges that humanity faces this millennium. ■

Adriana Marais, Nobel Laureate Steven Chu and Antonio Redondo, senior scientist at Los Alamos National Laboratory, discuss the importance of soft matter at the Mars Science Breakfast.

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Applying big data to address climate change

At Lindau this year, Mars hosted a Science Dinner for 130 researchers and 2 of its partners, IBM and the Lawrence Livermore National Laboratory, to discuss big data in science. The impact of big data on climate science was addressed by Lawrence Livermore's Benjamin Santer, an atmospheric scientist whose research focuses on topics such as climate model evaluation and the identification of natural and anthropogenic 'fingerprints' in observed climate records. Santer's early research contributed to the historic "discernible human influence" conclusion of the 1995 Second Assessment Report of the Intergovernmental Panel on Climate Change (IPCC).

Why did you attend the 2016 Lindau meeting?

The Lindau Nobel Laureate Meeting was an extraordinary opportunity to meet bright, highly motivated physicists from around the world, to inspire them and to be inspired by them. Many of today's pre-eminent climate modellers have backgrounds in physics. This was a chance to show these young scientists that they, too, can make significant contributions in climate science and that this field still has many interesting and important problems worthy of their attention. For a climate scientist, it's easy to be immersed in the virtual reality of modelling. The Lindau Nobel Laureate Meeting was an opportunity to get out into the real world, to find out what the next generation of physicists care about and to get their views on the work that I do.

What is climate fingerprinting?

Fingerprinting is about recognising patterns. Pattern information is very helpful in disentangling human effects on the climate from natural variations. The climate changes we've observed in the twentieth and twenty-first centuries are the result of multiple influences acting at the same time: human-caused changes in particulate pollution and atmospheric levels of greenhouse gases, purely natural fluctuations in the Sun's energy output and volcanic activity, and natural internal variations in the coupled atmosphere-ocean system. Each of these influences on the climate leaves a unique signature that manifests when you look at geographical patterns or at slices through the ocean or atmosphere. Using climate models, we can identify the unique fingerprints of these different influences and how they may have affected the climate system. We can simulate how the world's climate might have evolved without humans and ask whether these purely natural variations look like climate observations. The bottom line is: they don't.

How has big data changed your work?

In 1995, the model simulations that were performed in support of the IPCC's second assessment report totalled 1 gigabyte of output. Today, we routinely perform simulations of past, present and future climate. We now probe many different components of these simulations, including the atmosphere, oceans, sea ice, clouds and carbon cycle. We can access the entire world's collection of climate models from the comfort of our own offices. This represents a remarkable paradigm shift in only the past 25 to 30 years. Being able to perform these simulations, and to distribute petabytes of data to the entire scientific community, has resulted in better climate models. It has also improved our ability to quantify uncertainties in temperature change and sea-level rise out to 2100. These are things people really care about — not just scientists, but also policymakers and members of the public. This progress is extraordinary.

Benjamin Santer, atmospheric scientist at the Lawrence Livermore National Laboratory in California, discussing big data in climate science at the Mars Science Dinner.

Why have you dedicated your career to better understanding the climate?

In July, the US Republican Party adopted a formal platform to take the country out of the Paris climate accord. Even though President Obama has now signed the accord, it is unclear whether a Republican administration will attempt to back away from this commitment. In my opinion, the consequences of a US withdrawal from Paris would be catastrophic. At this critical time, it's more important than ever to present the scientific evidence for human fingerprints in the climate system, to improve understanding of expected climate changes in the twenty-first century, and to participate in international efforts to reduce greenhouse gas emissions. As scientists, we also have a responsibility to translate our research findings into plain English and speak to a variety of audiences. We have to be accountable: to tell the general public what we've learned with government funding, and why our research matters. In light of the Republican Party platform, the imperative to effectively communicate findings to society, policymakers and the media has never been greater. ■